Abstract Title Page

Title: Teaching Students What They Already Know? The misalignment between mathematics instructional content and student knowledge in kindergarten

Author(s): Mimi Engel, Amy Claessens, Maida Finch

Abstract Body

Background:

Kindergarten teachers spend limited time on mathematics instruction and focus most on basic math content (Rudd et al., 2008). In the nationally representative ECLS-K, kindergarten teachers report spending nearly twice as much instructional time on reading compared with math[1]; a pattern that continues in elementary school and has been documented over two decades (Morton & Dalton, 2007). Nearly 20 percent of kindergarten teachers report engaging in math instruction three or fewer times per week (Bargaglioti, et al., 2009).

The math skills that students acquire during kindergarten are key to later school success (Claessens et al., 2009; Claessens & Engel, 2011; Duncan, et al, 2007). Math learning during this time period is likely influenced by many things including instructional content, practices and modalities, as well as by the math skills children bring to the classroom. For example, recent research finds that students with low levels of skills benefit more from inferential than from basic instruction (Crosnoe et al., 2010).

We explore teacher survey reports of mathematics content covered and how that aligns with the content of the mathematics tests given to children. Further, we examine the relationship between content coverage during kindergarten, children's knowledge at kindergarten entry, and children's mathematics test score gains at the end of kindergarten. Interestingly, this work aligns with prior research in reading as well as important theory in mathematics learning.

Evidence on literacy practices finds that the most effective reading instruction varies by children's skill levels in language and literacy (Connor et al., 2004, 2009). Termed "Child × Instruction interactions", these studies find that children benefit from instructional activities and content that is adapted to their entering skill level (Connor, et al., 2004). Results from an experiment provide further evidence that literacy instruction aimed at meeting individual language and literacy needs results in the largest gains (Connor, et al., 2009). Further, theory on mathematics learning trajectories for young children posits that the mathematics that children already know should be key to determining the content that they should be taught (Clements & Sarama, 2009; Clements & Sarama, 2009). Our study provides preliminary evidence regarding the interaction between students' mathematics knowledge at kindergarten entry, the instruction they receive, and their end of kindergarten math test scores for a nationally representative sample.

The conceptual framework guiding the proposed study rests on the assumption that children's early skills are linked to school success because they provide a basic foundation for learning (Entwisle et al., 2005; Cunha et al, 2005). A child's predispositions and skills contribute to his own learning and to the environment in which he operates; in turn the child receives feedback from others in the environment (Meisels, 1998). This complex interaction between the child and his environment affects his developmental trajectory (Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998). We argue that children's school entry skills in mathematics will interact with the mathematics content they are exposed to in kindergarten and thus, predict their end of kindergarten math performance. For example, a child who enters kindergarten with high levels of math skills but is exposed to basic mathematics content, might not have the opportunity to develop new mathematics skills over the kindergarten year.

[1] Authors' calculation using ECLS-K.

Purpose:

Our study describes children's early math skills and the kindergarten mathematics content to which they are exposed. We focus specifically on teacher survey responses to items about content coverage that align most closely with the content covered on the ECLS-K kindergarten mathematics achievement test. We examine the influence kindergarten mathematics content coverage has on math achievement gains during kindergarten. Finally, we examine how children's level of math skills at school entry interacts with the math content covered in kindergarten. We hypothesize, based on prior research, that children have mastered math skills such as basic counting at kindergarten entry, but that kindergarten teachers continue to emphasize these basic skills. We also hypothesize that children will benefit most from exposure to math content that advances beyond their school entry skills. On the other hand, we anticipate that children in classrooms where teachers teach content that is at or below the skills with which they enter school will gain little to nothing in mathematics during kindergarten.

Setting:

The data used in this study come from the ECLS-K. The ECLS-K follows a nationally representative sample of children who were in kindergarten in 1998-99 through eighth grade. The dataset provides extensive information on children's academic skills at school entry and throughout elementary and middle school. The ECLS-K contains detailed information about children and families, and the child's teachers, classrooms, and schools. We use data from the fall and spring of kindergarten for this analysis.

Subjects:

Our analytic sample includes 11,681 students in 2,181 classrooms. Descriptive statistics for our analytic sample of 2,931 teachers are provided in Table 1. Almost all kindergarten teachers are women (96%). The average teacher is 41 years old, and most teachers are white (82%). Approximately one-third of teachers has at least a Masters degree, and have taught kindergarten for eight years, on average. Sample teachers have taken an average of three courses in teaching reading and two and a half in teaching math. The majority of the sample is certified (87%). Teachers report spending about 3 hours (186 minutes) per week on mathematics.

Table 2 shows descriptive statistics for 11,681 children for whom we have complete data on fall and spring of kindergarten achievement tests and classroom mathematics content information. At kindergarten entry, the average score on the first math subscale - identifying some one-digit numerals, recognizing geometric shapes, one to one counting of ten objects - is .92 out of 1. The average score on the second math subscale - reading all one-digit numeral, counting beyond ten, recognizing a sequence of patterns – is .55, and .21 for subscale three – reading two-digit numbers, recognizing the next number in a sequence, identifying the ordinal position of an object, and solving simple word problems. For subscale four – solving addition and subtraction problems – the average score is only .04.

Measures:

We construct mathematics content measures designed to align with the four mathematics proficiency areas measured by the ECLS-K mathematics achievement test in the fall of kindergarten using teacher survey reports from the spring of kindergarten on how often they focus on these math skills and activities. The intent behind aligning the content measures with

the mathematics achievement test subscales is to allow us to examine the relationship between student mathematics skills at kindergarten entry and content exposure. The four content measures are: *Basic Counting and Shapes; Patterns and Measurement; Place Value and Currency;* and *Addition and Subtraction*. Table 3 provides basic descriptive statistics for our content measures.

Data Analysis:

To test our hypotheses regarding student math skills and kindergarten math content, we are interested in the interaction between school entry math skill level, classroom content coverage, and end of kindergarten math achievement. First, we provide a description of the content coverage in kindergarten classrooms. Then, we examine how math content influences math gains across the kindergarten year. We model the relationship as follows:

$$MATH_{iSK} = a_1 + ß_1\, CONTENT_{iK} + ß_2 MATH_{iFK} + ß_3\, READING_{iFK} + ß_4 GENKNOW_{iFK} + ß_5\, CHILD_{iFK} + ß_6 FAM_{iFK} + ß_7 TEACHER_{iFK} + ß_8 CLASS_{iFK} + \varepsilon_i$$

Where $MATH_{iSK}$ is the math achievement test score of child i measured in the spring of kindergarten (SK) and $CONTENT_{iK}$ are the set of mathematics content areas covered in child i's classroom. $MATH_{iFK,}$ $READING_{iFK}$ and $GENKNOW_{iFK}$ are measures of child i's achievment assessed by tests in the fall of kindergarten. We include these measures to control for initial reading and math skills and cognitive ability. FAM_i and $CHILD_i$ are sets of family background and child characteristics included to control for individual differences that might influence math achievement before and after school entry. $TEACHER_{iFK}$ and $CLASS_{iFK}$ are the set of teacher characteristics such as experience and education and classroom characteristics such as time on mathematics and type of kindergarten to control for differences in children's teacher and kindergarten classroom experiences; a_1 is a constant and e_i is a stochastic error term.

Our interest is in estimating $ß_1$, which, if correctly modeled, can be interpreted as the relationship between the kindergarten math content measures and gains in kindergarten math test scores. A key challenge in this approach is ensuring that we have accounted for the possibility of omitted variable bias, which occurs if teacher, classroom, family, or child characteristics are correlated both with math content and math achievement and are omitted from our model. Our strategy for securing unbiased estimation of $ß_1$ is to estimate a model of the form of equation (1) that includes as many prior measures of relevant teacher, classroom, child, and family characteristics as possible.

Results:

Several important relationships emerge from our findings. First, descriptively, the vast majority of kindergarten students enter school having mastered basic counting and able to recognize geometric shapes. Second, among the mathematics content covered in kindergarten, teachers report spending the most time – nearly 13 days per month, on average – on basic counting and shapes. This suggests that children are exposed to mathematics content that they have already mastered for much of the time they spend learning mathematics during kindergarten. Results from multivariate regression models, in Table 4, indeed show that for the majority of children, the content measure "Basic Counting and Shapes" was negatively associated with math achievement across the kindergarten year and that children appeared to benefit most from exposure to more advanced mathematics content such as "Place Value and Currency" and "Addition and Subtraction". We also find statistically significant and meaningful

interactions between child skill levels and math content coverage. We find that children who had not mastered basic counting at kindergarten entry – approximately five percent of the overall sample -- benefited from this content coverage, whereas those children who already had these skills gained less in mathematics if their teachers reported spending more time on this content.

This study examines how teacher reported mathematics content coverage relates to children's mathematics achievement gains across the kindergarten year. We find that exposure to basic content was either negatively or not associated with math achievement measured at the end of kindergarten. For example, the content measure of Basic Counting and Shapes was associated with lower mathematics achievement at the end of kindergarten, for all but the lowest achieving students, suggesting that more exposure to basic mathematics content might actually be detrimental to children's math achievement. We also found that more advanced mathematics content in kindergarten was associated with increased math achievement across all children.

Conclusions:

The fact that most children have mastered certain basic math skills at kindergarten entry and that teachers report a substantial focus on these skills suggests a mismatch between the skills that many students have and the mathematics content they are typically exposed to in kindergarten. This misalignment between student skills and content covered is potentially problematic, and may result from several different factors. First, teachers are unsure about teaching mathematics and spend less time on mathematics than reading, particularly in the first years of school (Rudd et al., 2008). Thus, teachers may focus on the most basic skills because of a discomfort with teaching math or because of a lack of pedagogical or content knowledge for math teaching that goes beyond an introduction to numbers. In addition, teachers may not be aware of children's mathematics skill levels at kindergarten entry. For example, teachers in schools without early assessments in mathematics may have relatively little information about the skills their students have in mathematics; and thus, spend more time on the basics. Finally, it is possible that kindergarten teachers may, in fact, have a sense of what math skills children have, but may be following state or district mathematics standards for kindergarten classrooms that emphasize early number skills over more advanced mathematics skills (Reys et al, 2008).

The findings indicate that mathematics content coverage in kindergarten may not meet the needs of many students, and that closer attention to children's skills at school entry may be warranted. The effect sizes found in this study are modest. Typically around .03 of a standard deviation, the effect sizes suggest that a seemingly small shift in classroom content coverage would lead to small gains in math. For example, our results suggest that an average gain of .03 standard deviation units would be associated with a teacher spending time four more days per month on a particular mathematics content area, such as Addition and Subtraction. An effect size of .03 is larger in magnitude than the estimated relationship between many other classroom and teacher inputs and student achievement. For example, teacher qualifications, education, and experience were unrelated to children's achievement gains in the present study, and are consistently found to have small to null relationships with student achievement (Nye et al., 2004; Rockoff, 2004). More time in school, as indicated by full-day kindergarten, was related to increased math achievement with an effect size of about a tenth of a standard deviation. A comparison of the likely costs involved in shifting classroom math content to cover more advanced skills versus extending the school day suggests that small changes to content coverage might be a cost effective means for improving student math achievement.

Appendices

Appendix A. References

Bargagliotti, A. E., Guarino, C. M., & Mason, W.M. (2009). Mathematics in kindergarten and first grade in the United States at the start of the 21st century. Los Angeles: On-line Working Paper Series, California Center for Population Research.

Bronfenbrenner, U. & Ceci, S.J. (1994). Nature-nurture reconceptualized in developmental perspective: A biolecological model. *Psychological Review*, 101, 568-586.

Bronfenbrenner, U. & Morris, P.A. (1998). The ecology of developmental processes. In R. Lerner (Vol. Ed.) *Handbook of child psychology: Theoretical models of human development.* (5th Ed., Vol. 1, pp 993-1028). New York, N.Y.: John Wiley.

Claessens, A., Duncan, G., & Engel, M. (2009). Kindergarten Skills and fifth-grade achievement: Evidence from the ECLS-K. *Economics of Education Review*, *28*, 415-427.

Clements, D.H., & Sarama, J. (2009). *Learning and Teaching Early Math: The Learning Trajectories Approach*. Routledge, New York, NY.

Connor, C. M., Morrison, F. J., & Katch, L. E. (2004). Beyond the reading wars: Exploring the effects of child-instruction interactions on growth in early reading. *Scientific Studies in Reading*, *8*, 305-336.

Connor, C. M., Piasta, S. B., Fishman, B., Glasney, S., Schatschneider, C., et al. (2009). Individualizing student instruction precisely: Effects of child x instruction interaction on first graders' literacy development. *Child Development*, *80*, 77-100.

Crosnoe, R., Burchinal, M., Keating, D., Clarke-Stewart, K. A., Morrison, F, Pianta, R, & The Eunice Kennedy Shriver National Institute of Child Health and Human Development Early Child Care Research Network (2010). Instruction, teacher-student relations, and math achievement trajectories in elementary school. *Journal of Educational Psychology*, *102*, 407-417.

Cunha, F., Heckman, J., Lochner, L., & Masterov, D. (2005) Interpreting the evidence on life cycle skill formation. In E. Hanushek & F. Welch (Eds.) *Handbook of the Economics of Education*, The Netherlands: North Holland.

Duncan, G, Dowsett, C., Claessens, A., Magnuson, K., Huston, A., Klebanov, P., Pagani, L., et al. (2007). School Readiness and Later Achievement. *Developmental Psychology*, *43*, 1428-1446.

Entwisle, D., Alexander, K., & Olson, L. (2005). First grade and educational attainment by age 22: A new story. *American Journal of Sociology, 110*, 1458-1502.

Meisels, S. J. (1998). Assessing readiness. (Report No. 3-002). Ann Arbor, MI: Center for the Improvement of Early Reading Achievement. Retrieved September 15, 2001, from http://www.ciera.org/products/meisels-1998/reports32.html

Morton, B.A. & Dalton, B. (2007, May). *Changes in instructional hours in four subjects by public school teachers in grades 1 through 4* (NCES 2007-305). Washington, D.C.: U.S. Department of Education, National Center for Education Statistics.

Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis, 26,* 237–257.

Reys, B.J., Chval, K.B., & Switzer, J. (2008). *Mathematics Standards for Kindergarten: Summary of State-Level Attention and Focus*. Paper commissioned by the Committee for Early Childhood Mathematics, Mathematics Science Education Board, Center for Education, Division of Behavioral and Sciences Education, National Research Council, Washington, DC.

Rockoff, J. E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *American Economic Review, 94,* 2, 247-252.

Rudd, L.C., Lambert, M., Satterwhite, M., & Zaier, A., (2008). Mathematical language in early childhood settings: What really counts*? Early Childhood Education Journal, 36*(1)*,* 75-80.

Sarama, J., & Clements, D.H. (2009). *Early Childhood Mathematics Education Research: Learning Trajectories for Young Children*. Routledge, New York, NY.

Appendix B. Tables and Figures

Table 1. Descriptive statistics for kindergarten teachers for ECLS-K

	Full Sample n = 3243 (1)		Analytic Sample n = 2181 (2)		Full Sample Full Day n = 1965 (3)		Analytic Sample Full Day n = 1357 (4)		Full Sample Half Day n = 1272 (5)		Analytic Sample Half Day n = 820 (6)	
Teacher Characteristics	Mean	S.D.	Mean	S.D.	Mean	S.D.			Mean	S.D.	Mean	S.D.
Demographic characteristics												
Female	0.96	0.19	0.97	0.17	0.97	0.16	0.98	0.13	0.95	0.22	0.95	0.21
Hispanic	0.06	0.24	0.04	0.20	0.05	0.22	0.04	0.19	0.08	0.27	0.05	0.22
White	0.82	0.39	0.85	0.35	0.79	0.40	0.83	0.38	0.85	0.35	0.89	0.31
Black	0.06	0.25	0.05	0.23	0.10	0.29	0.08	0.27	0.02	0.13	0.01	0.12
Asian	0.02	0.14	0.02	0.14	0.02	0.14	0.02	0.14	0.02	0.14	0.02	0.13
Other	0.01	0.10	0.01	0.09	0.01	0.11	0.01	0.11	0.01	0.09	0.02	0.15
Age	40.99	10.03	41.36	9.87	40.50	10.05	40.70	9.91	41.74	9.94	42.38	9.71
Education and Experience												
Masters degree or higher	0.34	0.47	0.35	0.48	0.34	0.47	0.35	0.48	0.35	0.48	0.36	0.48
Years teaching kindergarten	8.18	7.39	8.44	7.33	8.14	7.22	8.48	7.29	8.27	7.65	8.38	7.42
College courses in:												
Early childhood education	4.16	2.18	4.26	2.15	4.28	2.13	4.39	2.09	3.98	2.24	4.06	2.20
Methods of teaching reading	3.14	1.86	3.21	1.85	3.07	1.81	3.12	1.81	3.24	1.91	3.33	1.89
Methods of teaching math	2.51	1.73	2.60	1.72	2.44	1.70	2.51	1.69	2.61	1.77	2.74	1.76
Certification												
Not certified	0.03	0.18	0.03	0.17	0.04	0.19	0.03	0.18	0.02	0.15	0.03	0.16
Temporary or probational certification	0.10	0.30	0.08	0.27	0.09	0.29	0.08	0.27	0.11	0.31	0.08	0.27
Lessons or projects on math (minutes per week)	186	108	188	107	210	107	213	103	148	99	146.73	100.96

Sample size varies due to missing data for individual variables (n= 3305).

Results are weighted using teacher weights.

Table 2. Descriptive statistics for child background characteristics

	Full Sample n = 16,906 (1)		Analytic Sample n = 11,681 (2)		Full Sample Full Day n = 9007 (3)		Analytic Sample Full Day n = 6477 (4)		Full Sample Half Day n = 7409 (5)		Analytic Sample Half Day n = 5183 (6)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Fall of Kindergarten Math Skills												
Subscale Scores												
Subscale 1	0.92	0.18	0.93	0.15	0.92	0.17	0.93	0.16	0.91	0.19	0.94	0.15
Subscale 2	0.55	0.35	0.58	0.34	0.55	0.35	0.57	0.35	0.54	0.35	0.59	0.34
Subscale 3	0.21	0.30	0.23	0.31	0.21	0.30	0.23	0.31	0.21	0.30	0.23	0.31
Subscale 4	0.04	0.12	0.04	0.13	0.04	0.12	0.04	0.13	0.03	0.12	0.04	0.12
Subscale 5	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.04	0.00	0.03	0.00	0.03
Full Scale IRT Test Scores												
Math	25.83	9.00	26.62	9.13	25.96	9.01	26.53	9.21	25.72	8.99	26.75	9.02
Reading	35.10	9.97	35.32	9.99	35.29	9.98	35.48	10.06	34.83	9.89	35.12	9.91
General Knowledge	22.38	7.43	22.65	7.42	21.81	7.44	22.06	7.49	23.13	7.32	23.39	7.26
Baseline Child Characteristics												
White	0.58	0.49	0.64	0.48	0.54	0.50	0.59	0.49	0.63	0.48	0.71	0.45
Black	0.16	0.37	0.15	0.36	0.23	0.42	0.22	0.41	0.08	0.27	0.07	0.26
Hispanic	0.19	0.39	0.13	0.34	0.16	0.36	0.12	0.33	0.22	0.42	0.15	0.36
Asian	0.03	0.16	0.02	0.15	0.02	0.15	0.02	0.14	0.03	0.17	0.03	0.16
Other	0.05	0.21	0.05	0.22	0.05	0.22	0.05	0.23	0.04	0.20	0.04	0.20
Female	0.49	0.50	0.49	0.50	0.49	0.50	0.49	0.50	0.48	0.50	0.48	0.50
Age (in months at Fall Assessment)	68.46	4.27	68.55	4.26	68.74	4.27	68.77	4.23	68.14	4.26	68.28	4.27
Geographic Controls												
Urban	0.38	0.49	0.35	0.48	0.42	0.49	0.38	0.48	0.35	0.48	0.32	0.47
Rural	0.20	0.40	0.23	0.42	0.23	0.42	0.26	0.44	0.17	0.38	0.20	0.40
Suburban	0.41	0.49	0.42	0.49	0.35	0.48	0.37	0.48	0.48	0.50	0.48	0.50
Home Environment												
Maternal education (high school or less)	0.45	0.50	0.42	0.49	0.47	0.50	0.45	0.50	0.42	0.49	0.39	0.49
Single parent	0.23	0.42	0.21	0.41	0.26	0.44	0.24	0.43	0.19	0.39	0.18	0.38
Number of siblings	1.46	1.15	1.42	1.10	1.43	1.17	1.40	1.12	1.48	1.13	1.45	1.08
English not primary home language	0.12	0.32	0.06	0.23	0.09	0.29	0.05	0.22	0.14	0.34	0.06	0.24

Sample size for individual variables varies due to missing data.

Results are weighted using student weights.

Table 3. Descriptive statistics and items for content measures

Content Measures	Individual items from teacher survey	Item Mean	Full Sample Mean	Full Sample S.D.	Full Day Mean	Full Day S.D.	Half Day Mean	Half Day S.D.	Corresponding student math proficiency level, spring Kindergarten
1. Basic Counting and Shapes			12.71	4.11	13.22	4.11	11.92	3.97	Subscale 1
α=.58	Count out loud	18.00							Identify some one-digit numerals, recognize geometric shapes, 1:1 counting, up to ten objects.
	Work with geometric manipulatives	9.80							
	Correspondence between number and quantity	14.32							
	Recognizing and naming geometric shapes	8.70							
2. Patterns and Measurement			7.68	4.44	8.25	4.63	6.82	3.84	Subscale 2
α=.78	Work with rulers and other measuring instruments	3.80							Reading all one-digit numerals, counting beyond ten, recognizing a sequence of patterns, and using nonstandard units of length to compare objects.
	Identifying relative quantity	10.06							
	Sorting objects according to a rule	7.65							
	Ordering objects by size or other property	6.88							
	Making, copying, or extending patterns	10.01							
3. Place Value and Currency			8.61	5.12	9.09	5.14	7.81	4.99	Subscale 3
α=.60	Recognizing the value of coins and currency	6.11							Reading two-digit numerals, recognizing the next number in a sequence, identifying the ordinal position of an object, solving simple word problem.
	Place value	6.93							
	Reading two-digit numbers	12.95							
	Ordinal numbers	8.46							
4. Addition and Subtraction			4.38	4.07	2.50	4.30	3.30	3.39	Subscale 4
α=.71	Adding single-digit numbers	8.75							Solving simple addition and subtraction problems.
	Subtracting single-digit numbers	6.81							
	Adding two-digit numbers	1.25							
	Subtracting two-digit numbers, without regrouping	0.69							
n			2181		1357		820		

Table 4. Regression coefficients and standard errors from models predicting spring kindergarten math achievement by standardized content measures

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Basic counting and shapes	-0.024***	-0.021***	-0.0032										-0.044***	-0.034***	-0.0067
	(0.008)	(0.008)	(0.008)										(0.010)	(0.009)	(0.010)
Patterns and measurement				-0.0031	-0.0067	-0.0020							-0.0067	-0.013	-0.0096
				(0.008)	(0.007)	(0.008)							(0.009)	(0.009)	(0.010)
Place value and currency							0.036***	0.031***	0.013*				0.041***	0.035***	0.012
							(0.008)	(0.008)	(0.008)				(0.009)	(0.008)	(0.009)
Addition and subtraction										0.038***	0.035***	0.022***	0.034***	0.032***	0.022**
										(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.009)
Full Day	0.078***	0.099***	0.12***	0.070***	0.096***	0.12***	0.060***	0.092***	0.12***	0.052***	0.084***	0.12***	0.062***	0.091***	0.12***
	(0.018)	(0.019)	(0.042)	(0.018)	(0.019)	(0.042)	(0.017)	(0.019)	(0.042)	(0.018)	(0.019)	(0.042)	(0.017)	(0.018)	(0.042)
Fall K Math	0.82***	0.67***	0.67***	0.82***	0.67***	0.67***	0.82***	0.67***	0.67***	0.82***	0.67***	0.67***	0.82***	0.67***	0.67***
	(0.010)	(0.014)	(0.008)	(0.010)	(0.014)	(0.008)	(0.010)	(0.014)	(0.008)	(0.010)	(0.014)	(0.008)	(0.010)	(0.014)	(0.008)
Time on math/week		0.025***	0.0035		0.022***	0.0032		0.017**	0.0026		0.016**	0.00031		0.020***	0.0021
		(0.007)	(0.008)		(0.007)	(0.008)		(0.007)	(0.008)		(0.007)	(0.008)		(0.007)	(0.008)
Teacher Qualifications		X	X		X	X		X	X		X	X		X	X
Student Characteristics		X	X		X	X		X	X		X	X		X	X
Cognitive Skills		X	X		X	X		X	X		X	X		X	X
Fixed Effects			X			X			X			X			X
Observations	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681	11,681
R-squared	0.688	0.714	0.760	0.687	0.714	0.760	0.688	0.715	0.760	0.688	0.715	0.760	0.691	0.716	0.760

Robust standard errors in parentheses, clustered by school

*** p<0.01, ** p<0.05, * p<0.1

Results are weighted.